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(54) DEVICE FOR LAUNCHING PERCUSSION GROUND BORERS

(71) I, PAUL SCHMIDT, a German citizen, of Reinherstrasse, D-5940 Lenne-
 stadt-Saalhausen, West Germany, do hereby
 declare the invention, for which we pray that
 a patent may be granted to us, and the
 method by which it is to be performed, to
 be particularly described in and by the
 following statement:—

Percussion bores for boring holes in the
 form of small tunnels in the ground are used
 principally for laying supply lines, for ex-
 ample water-pipes, electrical cables and tele-
 phone lines under roads, embankments or
 footways, without it being necessary to exca-
 vate the surface of the road or roadways. For
 this purpose, the percussion borer, which is
 usually pneumatically driven, moves through
 the ground, the soil in front of the borer be-
 ing displaced sideways and the borer leaving
 behind it a hole, into which the supply lines
 can be drawn either immediately behind the
 borer or later.

Existing percussion borers have a percus-
 sion bit mounted in the front end of a hous-
 ing and a piston which is slidable to and fro
 in the housing to strike the percussion bit,
 the piston being operated by compressed
 air. When the piston is accelerated forwards
 a backward impulse is produced and this is
 counteracted by friction between the outside
 of the housing and the surrounding ground
 as the percussion bit is driven forwards in
 the ground. When the percussion borer is
 started up at the beginning of a bore, this
 backward impulse must be counter-acted,
 even though at this stage the housing is not
 within the ground. In practice, the usual
 technique for counteracting the backward
 impulse has been to make use of a support
 in the form of a stake, which is driven into
 the ground behind the borer and is used as
 a lever acting on the borer. This technique
 is not only complicated and time-consuming,
 but also usually makes it impossible to align
 the borer accurately on to the target and at
 the same time to counteract the backward
 impulse correctly.

The aim of the present invention is to pro-

vide a launching device for supporting a
 percussion borer at the start of a boring
 operation to withstand the backward im-
 pulse of the borer and permit launching of
 the borer in an extremely simple and con-
 venient manner with good target alignment.

To this end, such a device comprises a
 base plate, a carrier for holding the borer,
 the carrier being angularly adjustable rela-
 tive to the base plate in vertical and hori-
 zontal directions, means for mounting the
 borer on the carrier, and means for anchor-
 ing the base plate to the ground whereby
 backward impulses on the borer are trans-
 mitted through the carrier and the base plate
 and counteracted by reaction forces from
 the ground, the carrier comprising a trough
 which is arranged to receive the borer and
 is universally pivotally mounted on the base
 plate at its forward end by means of a pivot-
 ing head to provide the angular adjustability
 of the carrier and the mounting means com-
 prising a braking roll which, in use, engages
 with the borer and is free to rotate in the
 forward feed direction of the borer but is
 non-rotatable in an opposite direction to
 permit forward movement but rest backward
 movement of the borer relative to the
 carrier.

The device in accordance with the in-
 vention enables the launching of the per-
 cussion borer to be carried out very easily
 and simply, since the percussion borer can
 not only be very easily aimed at the desired
 target, but in addition the backward im-
 pulse occurring at launching is satisfactorily
 counteracted.

The device consists of comparatively few
 components, while satisfying the require-
 ments of easy and convenient handling with
 accurate alignment of the borer on to a tar-
 get on the one hand and a satisfactory re-
 sistance to the backward impulse force on
 the other hand.

Preferably, the trough consists of a bear-
 ing shell substantially of semi-cylindrical or
 prismatic cross-section, extending longitudi-
 nally of the base plate. This therefore pro-
 vides a very good seating for the percussion

borer, which normally has a cylindrical housing.

The desired alignment of the trough or bearing shell together with the percussion borer resting thereon can be achieved both in elevation and direction by simple adjustment of the trough or bearing shell owing to the pivotal mounting of the trough or bearing shell at its forward end in a universal manner.

The adjustment of the bearing shell relative to the base plate can be carried out in various ways. The height adjustment for example can be obtained by a strap which is fixed to the underside of the trough or bearing shell, the strap having near to its ends, which project on both sides beyond the trough or bearing shell, screw-threaded bores receiving adjusting screws which bear on the base plate to enable vertical adjustment of the trough or shell to be effected. By rotating these adjustment screws the bearing shell can be set to the desired elevation.

The supporting of the trough or bearing shell from the base plate is preferably effected by a supporting plate which is hinged to the strap and the other end of the supporting plate bears against a part fixed to the base plate. For the part fixed to the base plate, a rod may preferably be used and this is preferably releasably clamped between straps fixed to the base plate and is preferably serrated. When setting the bearing shell in the horizontal direction, the end of the supporting plate is then guided along the serrations of the rod, which is bent to a circular arc.

The braking roll is preferably of concave axial section and thus fits a cylindrical housing of the percussion borer. The braking roll is preferably adjustably journaled in a mounting and this mounting may comprise a substantially U-shaped mounting frame fixed to the bearing shell.

A constructionally very simple setting of the braking roll is obtained if this roll is journaled to pivot at one end in one side arm of the U-shaped mounting frame and is height-adjustable at its other end in the other side arm of the mounting frame by means of a spring and a capstan head screw. The pivotal bearing of the braking roll enables the percussion borer to be easily laid upon the trough or bearing shell and enable the roll then to be easily placed upon the bore from above, a sufficient pressure then being applied on to the percussion borer by means of the capstan head screw to hold the borer in position on the trough or shell.

An example of a launching device in accordance with the invention will now be described with reference to the accompanying drawings, in which:—

Figure 1 is a perspective view of the device from above and from one side;

Figure 2 is a front elevation; and, Figure 3 is an elevation of the other side.

The launching device, which launches a percussion borer 1 shown in chain-dotted lines in Figure 1, comprises a base plate 2, which is anchored in the ground by means of ground anchor pegs 4 driven through openings 3 in the base plate. Above the base plate 2 and extending in the longitudinal direction of the base plate is a semi-cylindrical bearing shell or trough 5 forming a carrier to the lower face of which a strap 6 is welded. Near the ends of the strap 6, which project on either side of the bearing shell 5, threaded bores 7 are situated, through which adjustment screws 8 are screwed and bear against the base plate 2. A support plate 11 is attached to one end of the strap 6 by a hinge 9. The support plate 11 bears at its other end against a rod 12, which is furnished with serrations and lies on a circular arc, this rod being firmly clamped in position by straps 13 fixed to the base plate 2 and by clamping screws 14. Whereas the straps 13 are close to one end of the base plate 2 and the strap 6 is fixed near the middle of the bearing shell 5, the bearing shell 5 is supported at its forward end by means of a pivoting head 15, which is universally pivotable. This makes rotational and pivoting movement of the front end of the shell 5 possible.

Between the pivoting head 15 and the strap 6, a braking device 17 is mounted upon the bearing shell 5 by means of a mounting 16. The braking device 17 consists basically of a braking roll 18, concave in axial section, which is journaled in the mounting 16 to rotate freely in a forward feed direction of the borer but is prevented from rotating in a rearward direction. As can be seen from Figure 2, in use, the braking roll 18 bears with the lower part of its periphery against the percussion borer 1. The mounting 16 comprises a U-shaped mounting frame 19, which in turn includes a transverse web 21, welded to the underside of the bearing shell 5, and two vertical arms 22, 23. The braking roll 18 is rotatable on a shaft which is pivotally journaled in one arm 22 by means of a pin 24, while it is journaled in the other arm 23 of the mounting frame 19 in a height-adjustable manner, being movable upwards and downwards in a longitudinal slit in the arm 23 under the control of a spring 25 and a capstan head screw 26. The arm 23 of the mounting frame, which is situated on the height-adjustable side of the braking roll 18, is pivotally journaled by a pin 27 on the transverse web 21 of the mounting frame 19.

At the site in which the beginning of a hole is to be bored, the base plate 2 is anchored firmly in the ground by means of the ground anchor pins 4. Then, with the

arm 23 of the mounting frame 19 folded outwards and the braking roll 18 swung upwards and outwards, the percussion borer 1 is placed from above into the bearing shell 5. The carrier formed by the shell 5 is then adjusted to align the borer on to the target. This is done in elevation by adjustment of the adjusting screws 8 and in a direction transversely by lateral pivoting of the shell 5 about the pivoting head 15 with the rear end of the supporting plate 11 sliding along the rod 12. The launching device is then ready for launching the borer and the borer can be put in operation.

In the region of the pivoting head 15, an angular scale may be disposed, which in conjunction with a spirit level indicates the angle of inclination of the carrier shell 5. The semi-cylindrical bearing shell 5 can of course be of other cross-sections, for example prismatic so long as it holds the borer firmly in position.

WHAT I CLAIM IS:—

1. A launching device for launching a percussion borer at the start of a ground boring operation the device comprising a base plate, a carrier for holding the borer, the carrier being angularly adjustable relative to the base plate in vertical and horizontal directions, means for mounting the borer on the carrier, and means for anchoring the base plate to the ground whereby backward impulses on the borer are transmitted through the carrier and the base plate and counteracted by reaction forces from the ground, the carrier comprising a trough which is arranged to receive the borer and is universally pivotally mounted on the base plate at its forward end by means of a pivoting head to provide the angular adjustability of the carrier and the mounting means comprising a braking roll which, in use, engages with the borer and is free to rotate in the forward feed direction of the borer but is non-rotatable in an opposite direction to permit forward movement but resist backward movement of the borer relative to the carrier.

2. A device according to claim 1, in which the trough consists of a bearing shell substantially of semi-cylindrical or prismatic cross-section, extending longitudinally of the base plate.

3. A device according to claim 1 or claim 2, in which a strap is fixed to the underside of the trough or bearing shell, the strap having near to its ends, which project on both sides beyond the trough or bearing shell, screw-threaded bores receiving adjusting screws which bear on the base plate to enable vertical adjustment of the trough or shell to be effected.

4. A device according to claim 3, in which one end of a supporting plate is hinged to the strap and the other end of the supporting plate bears against a part fixed to the base plate.

5. A device according to claim 4, in which the part fixed to the base plate is a rod which is releasably clamped between straps which are fixed to the base plate.

6. A device according to claim 5, in which the rod is serrated.

7. A device according to claim 5 or claim 6, in which the straps are fixed near the rearward end of the base plate and the strap which is fixed to the trough or shell is near the middle of the length of the trough or shell.

8. A device according to any one of the preceding claims, in which the braking roll is of concave shape in axial section.

9. A device according to any one of the preceding claims, in which the braking roll is adjustably mounted in a mounting for adjustment in position towards or away from the trough or shell.

10. A device according to claim 9, in which the braking roll mounting comprises a substantially U-shaped mounting frame fixed to the trough or shell.

11. A device according to claim 10, in which the braking roll is journaled to pivot at one end in one side arm of the U-shaped mounting frame and is height-adjustable at its other end in the other side arm of the mounting frame by means of a spring and a capstan head screw.

12. A device according to claim 11, in which the arm of the mounting frame which is situated on the height-adjustable side of the braking roll has a longitudinal slit.

13. A device according to claim 12, in which the arm of the mounting frame which has the slit is pivoted in a transverse web of the mounting frame, the web forming the base of the U and connecting the two side arms together and being situated underneath the trough or shell.

14. A device according to any one of the preceding claims, in which the means for anchoring the carrier to the ground comprises holes through the base plate and ground anchor pins adapted to be driven into the ground through the holes.

15. A device according to claim 1, substantially as described with reference to the accompanying drawings.

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